WHAT IS CLAIMED IS:

1. A method for controlling condensation in an engine system, the engine system having an engine including an intake manifold and an exhaust manifold, an exhaust gas recirculation valve that regulates an amount of exhaust gas recirculated from the exhaust manifold to the intake manifold, a first signal indicative of an intake manifold temperature, a second signal indicative of an intake manifold pressure, a third signal indicative of an engine speed, a fourth signal indicative of an air humidity, a fifth signal indicative of an air temperature, and a sixth signal indicative of an engine speed, the method comprising the steps of:

calculating as a function of the first, second, third, fourth, fifth and sixth signals a critical value indicative of the potential for condensation in the intake manifold;

determining whether the critical value exceeds a threshold value indicative of the point at which condensation will occur in the intake manifold; and

closing the exhaust gas recirculation valve if the threshold value is exceeded.

2. The method of claim 1 further comprising the step of opening the exhaust gas recirculation valve if the threshold value is not exceeded.

3. The method of claim 2 wherein the exhaust gas recirculation valve is not closed unless the critical value exceeds the threshold value for a set period of time and is not opened unless the critical value does not exceed the threshold value for a set period of time.

4. The method of claim 1 wherein the critical value is determined as a function of the expression

(A*RPM) + (B*IMP) + (C*EGR_Rate) + (D*TCI)+(E*IMT) + (F*RH) + (G*TCI*IMT*RH) + H + (I*(IMT^2)) + (J*(RH^2)) + (K*RPM*EGR_Rate) + (L*IMP*TCI) + (M*EGR_Rate*RH) + (N*TCI*IMT) + (O*TCI*RH) + (P*IMT*RH)

where:

IMP is the intake manifold pressure,

IMT is the intake manifold temperature,

EGR_Rate is the mass flow rate of the exhaust gas recirculated to the intake manifold,

RH is the air humidity,

RPM is the engine speed,

TCI is the air temperature, and

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, and P are constants.

5. The method of claim 1 wherein the first signal indicative of an intake manifold temperature is provided by a temperature sensor located near the intake manifold.

6. The method of claim 1 wherein the second signal indicative of an intake manifold pressure is provided by a pressure sensor located near the intake manifold.

7. The method of claim 1 wherein the third signal indicative of the engine speed is provided by an engine control module.

8. The method of claim 1 wherein the fourth signal indicative of an air humidity is measured in an air inlet conduit that provides air to the compressor.

9. The method of claim 1 wherein the fifth signal indicative of an air temperature is provided by a temperature sensor located in an air inlet conduit that provides air to the compressor.

10. A method for controlling condensation in a vehicle, the vehicle having an engine system, the engine system including an internal combustion engine, intake and exhaust manifolds coupled to the engine, a turbocharger selectively powered by an exhaust gas from the exhaust manifold and adapted to provide compressed air to the intake manifold, an exhaust gas recirculation valve

that regulates an amount of exhaust gas recirculated from the exhaust manifold to the intake manifold, a first signal indicative of an intake manifold temperature, a second signal indicative of an intake manifold pressure, a third signal indicative of an engine speed, a fourth signal indicative of an air humidity, a fifth signal indicative of an air temperature, and a sixth signal indicative of a mass flow rate of the exhaust gas recirculated from the exhaust manifold to the intake manifold, the method comprising the steps of:

calculating as a function of the first, second, third, fourth, fifth, and sixth signals an IMT Critical value indicative of the potential for condensation in the intake manifold;

determining whether the IMT Critical value exceeds a threshold value indicative of the point at which condensation will occur in the intake manifold; and

closing the exhaust gas recirculation valve if the threshold value is exceeded.

11. The method of claim 10 wherein the exhaust gas recirculation valve is not closed unless the IMT Critical value exceeds the threshold value for a predetermined period of time.

12. The method of claim 10 wherein the exhaust gas recirculation valve is not closed unless the IMT Critical value exceeds the threshold value for a predetermined number of iterations.

13. The method of claim 10 further comprising the step of opening the exhaust gas recirculation valve if the IMT Critical value does not exceed the threshold value.

14. The method of claim 13 wherein the exhaust gas recirculation valve is not opened unless the IMT Critical value does not exceed the threshold value for a predetermined period of time.

15. The method of claim 13 wherein the exhaust gas recirculation valve is not opened unless the IMT Critical value does not exceed the threshold value for a predetermined number of iterations.

16. A method for controlling condensation in a vehicle, the vehicle having an engine system, the engine system including an engine having an intake manifold, a gas compression device adapted to provide a compressed gas to the intake manifold, an exhaust gas recirculation valve that regulates an amount of exhaust gas recirculated to the intake manifold, and a set of signals indicative of the operating state of the engine system, the method comprising the steps of:

providing the set of signals indicative of intake manifold temperature, intake manifold pressure, intake air temperature, intake air humidity, and exhaust gas mass flow rate;

determining a critical value indicative of condensation in the intake manifold;

comparing the critical value to a predetermined range;

actuating the exhaust gas recirculation valve toward a closed position if the critical value is within the predetermined range; and

actuating the exhaust gas recirculation valve toward an open position if the critical value is outside the predetermined range.

17. The method of claim 16 wherein the exhaust gas recirculation valve is not actuated toward the closed position unless the critical value is within the predetermined range for a set period of time.

18. The method of claim 16 wherein the exhaust gas recirculation valve is not actuated toward the open position unless the critical value is outside the predetermined range for a set period of time.

19. The method of claim 16 wherein a humidity signal indicative of intake air humidity is provided by a humidity sensor located in an air inlet conduit.

20. The method of claim 20 wherein the humidity signal and a temperature signal indicative of intake air temperature are provided by a sensor module located in the air inlet conduit.